Abstract

A thermal bend actuator includes a wafer substrate. An elongate actuator arm is fixed to the substrate at a fixed end. The elongate actuator arm includes a heater layer of a conductive material and a dielectric, resiliently flexible layer. The heater layer defines a heater circuit which is connected to an electrical potential. A working member is fixed to an opposite free end of the actuator arm. Control logic circuitry is positioned on the substrate, between, and generally aligned with, the heater layer and the substrate. The control logic circuitry is interconnected between a data input means and the heater circuit and includes register circuitry connected to the data input means to generate an enabling signal. Firing circuitry is connected between the register circuitry and the heater circuit to close the heater circuit on receipt of the enabling signal so that said electrical potential generates a current in the heater circuit, resistively to heat the heater layer. At least the heater layer is of a material that has a coefficient of thermal expansion which is such that the heater layer can expand on heating and contract on cooling to do work. The heater layer is positioned so that the elongate actuator arm experiences differential thermal expansion and contraction and thus reciprocally displaces the working member.